



Designation: B105 – 05 (Reapproved 2020)

Standard Specification for Hard-Drawn Copper Alloy Wires for Electric Conductors¹

This standard is issued under the fixed designation B105; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

This standard has been approved for use by agencies of the U.S. Department of Defense.

1. Scope

1.1 This specification covers hard-drawn round copper alloy wires for electric conductors.

1.2 The copper alloy wires shall be made in any one of ten distinct alloys designated 8.5 to 85 in accordance with their increasing conductivities or designated by assigned UNS numbers (see Explanatory [Note 1](#)) as follows:

Copper Alloy UNS No.		Copper Alloy UNS No.	
Alloy 8.5	C65100	Alloy 40	
Alloy 13	C51000	Alloy 55	C16500
Alloy 15		Alloy 74	C19600
Alloy 20		Alloy 80	C16200
Alloy 30	C50700	Alloy 85	C16200

1.3 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

1.3.1 *Exception*—The SI values of density and resistivity are to be regarded as standard.

1.4 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 The following documents of the issue in effect on the date of material purchase form a part of this specification to the extent referenced herein.

¹ This specification is under the jurisdiction of the ASTM Committee B05 on Copper and Copper Alloys and is the direct responsibility of Subcommittee B05.02 on Rod, Bar, Wire, Shapes and Forgings.

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2.2 ASTM Standards:²

[B193 Test Method for Resistivity of Electrical Conductor Materials](#)

[B258 Specification for Standard Nominal Diameters and Cross-Sectional Areas of AWG Sizes of Solid Round Wires Used as Electrical Conductors](#)

[E527 Practice for Numbering Metals and Alloys in the Unified Numbering System \(UNS\)](#)

2.3 Other Document:

[NBS Handbook 100—Copper Wire Tables³](#)

3. Ordering Information

3.1 Orders for material under this specification should include the following information:

3.1.1 Quantity of each size and grade,

3.1.2 Wire size: diameter in inches or millimetres (see [9.1](#) and [Table 1](#)),

3.1.3 Alloy (see [1.2](#) and [Table 1](#)),

3.1.4 Special composition limits, if required (see [5.2](#)),

3.1.5 Package size (see [14.1](#)),

3.1.6 Special package marking, if required, and

3.1.7 Place of inspection (see [13.1](#)).

4. Materials and Manufacture

4.1 The material used shall be copper alloys of such nature and composition as to secure by proper treatment the properties prescribed in this specification for the finished wire.

5. Chemical Composition

5.1 The chemical composition of copper alloy wires shall conform to the requirements of [Table 2](#). The values prescribed in [Table 2](#) cover limits of composition of the different alloys which may be supplied (see [Note 2](#)).

² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

³ Available from National Technical Information Service (NTIS), 5301 Shawnee Rd., Alexandria, VA 22312, <http://www.ntis.gov>.

TABLE 1 Tensile Requirements^A

NOTE 1—Conversion factors are presented for ready adaptation to computer readout and electronic data transmission. The factors are written as a number greater than one and less than ten with six or less decimal places. This number is followed by the letter E (for exponent), a plus or minus symbol, and two digits which indicate the power of 10 by which the number must be multiplied to obtain the correct value. For example: $2.54 \text{ E} + 01 = 2.54 \times 10^1 = 25.4$.

Elongation, min, % in 10 in. (250 mm)					Tensile Strength, min																		
					Alloy 8.5		Alloy 13		Alloy 15 and 20		Alloy 30		Alloy 40		Alloy 55		Alloy 74		Alloy 80		Alloy 85		
Diameter		Area		mm ²	ksi	Mpa	ksi	Mpa	ksi	Mpa	ksi	Mpa	ksi	Mpa	ksi	Mpa	ksi	Mpa	ksi	Mpa			
in.	mm	cmil	in. ²		Alloy 8.5	Alloy 13	Alloy 15 and 20	Alloy 30	Alloy 40	Alloy 55	Alloy 74	Alloy 80	Alloy 85										
0.2893	7.348	83694	0.06573	42.41	2.2	97.5	672.2	102.5	706.7	109.5	755.0	74.0	510.2	73.4	508.1	76.0	524.0	74.0	510.2	72.0	496.4	68.5	472.3
0.2576	6.543	66358	0.05212	33.62	2.0	103.8	715.7	108.8	750.2	114.5	789.5	80.0	551.6	74.9	516.4	77.8	536.4	75.5	520.6	73.5	506.8	69.9	481.9
0.2294	5.827	52624	0.04133	26.67	1.8	107.5	741.2	112.5	775.7	118.5	817.0	85.0	586.1	76.3	526.1	79.3	546.8	77.5	534.3	75.0	517.1	71.2	490.9
0.2043	5.189	41738	0.03278	21.15	1.6	110.2	759.8	115.2	794.3	121.3	836.3	89.0	613.6	77.7	535.7	80.9	557.8	79.0	544.7	76.4	526.8	72.5	499.9
0.1819	4.620	33088	0.02599	16.77	1.5	112.2	773.6	117.2	808.1	123.3	850.1	92.5	637.8	79.0	544.7	82.4	568.1	80.0	551.6	77.5	534.3	73.6	507.5
0.1620	4.115	26244	0.02061	13.30	1.4	114.0	786.0	119.0	820.5	125.0	861.9	94.8	653.6	80.4	554.3	84.0	579.2	81.0	558.5	78.6	541.9	74.7	515.0
0.1443	3.665	20822	0.01635	10.55	1.3	115.3	795.0	120.3	829.4	126.5	872.2	96.5	665.3	81.8	564.0	85.5	599.5	82.4	568.1	79.8	550.2	75.8	522.6
0.1285	3.264	16512	0.01297	8.367	1.3	116.6	803.9	121.6	838.4	127.9	881.8	97.9	675.0	83.2	573.6	87.0	599.8	83.5	575.7	81.0	558.5	77.0	530.9
0.1144	2.906	13087	0.01028	6.632	1.2	117.8	812.2	122.8	846.7	129.2	890.8	99.0	682.6	84.6	583.3	88.5	610.2	84.6	583.3	82.2	566.8	78.1	538.5
0.1019	2.588	10384	0.008155	5.262	1.2	118.9	819.8	123.9	854.3	130.3	898.4	100.1	690.2	86.0	593.0	90.0	620.5	85.5	589.5	83.4	575.0	79.2	546.1
0.0907	2.304	8226.5	0.006461	4.1684	1.2	119.8	826.0	124.8	860.5	131.2	904.6	101.2	697.8	87.1	600.5	91.3	629.5	86.6	597.1	84.6	583.3	80.3	553.7
0.0808	2.052	6528.6	0.005128	3.308	1.1	120.6	831.5	125.6	866.0	132.0	910.1	102.2	704.6	88.2	608.1	92.6	638.5	87.7	604.7	85.7	590.9	81.4	561.2
0.0720	1.829	5184.0	0.004072	2.627	1.1	121.2	835.6	126.2	870.1	132.6	914.3	103.0	710.2	89.6	617.8	93.8	646.7	88.8	612.3	86.8	598.5	82.5	568.8
0.0641	1.628	4108.8	0.003227	2.082	1.1	121.7	839.1	126.7	873.6	133.2	918.4	103.7	715.0	90.4	623.3	95.0	655.0	89.8	619.2	87.8	605.4	83.4	575.0
0.0571	1.450	3260.4	0.002561	1.652	1.0	122.2	842.5	127.2	877.0	133.6	921.1	104.4	719.8	91.4	630.2	96.0	661.9	90.6	624.7	88.7	611.6	84.2	580.5
0.0508	1.290	2580.6	0.002027	1.308	1.0	122.5	844.6	127.5	879.1	134.0	923.9	105.2	725.3	92.1	635.0	97.0	668.8	92.0	634.3	89.5	617.1	85.0	586.1
0.0453	1.151	2052.1	0.001612	1.040	1.0	122.8	846.7	127.8	881.2	134.2	925.3	105.9	730.2	93.1	641.9	98.0	675.7	92.8	639.8	90.3	622.6	85.7	590.9
0.0403	1.024	1624.1	0.001276	0.8229	0.9	123.0	848.1	128.0	882.5	134.5	927.4	106.6	735.0	94.0	648.1	98.6	679.8	93.5	644.7	91.0	627.4	86.4	595.7
0.0359	0.912	1288.8	0.001012	0.6530	0.9	123.2	849.4	128.2	883.9	134.8	929.4	107.3	739.8	94.5	651.6	99.0	682.6	94.0	648.1	91.6	631.6	87.0	599.8
0.0320	0.813	1024.0	0.0008043	0.5189	0.9	123.5	851.5	128.5	886.0	135.0	930.8	108.0	744.8	95.0	655.0	99.5	686.0	94.5	651.6	92.2	635.7	87.6	604.0

Conversion factors: 1 in. = 2.54 E + 01 mm, 1 kcmil = 5.067 E - 01 mm², 1 in.² = 6.452 E + 02 mm², 1 ksi = 6.895 E + 00 MPa.

^A Conversion factors: 1 in. = 2.54 E + 01 mm, 1 kmil = 5.067 E - 01 mm², 1 in.² = 6.452 E + 02 mm², 1 ksi = 6.895 E + 00 MPa.